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AN
INAUGURAL DISSERTATION
ON
H Y D R O C E L E.

SUBMITTED TO THE EXAMINATION OF
THE REV. JOHN EWING, S. T. P. PROVOST;
THE
TRUSTEES AND MEDICAL FACULTY
OF THE
UNIVERSITY OF PENNSYLVANIA,

ON THE 12TH DAY OF MAY, 1797.

FOR THE DEGREE OF
DOCTOR OF MEDICINE
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MEMBER OF THE
MEDICAL AND CHEMICAL SOCIETIES
OF
PHILADELPHIA.

Philadelphia:
PRINTED BY STEPHEN C. USTICK.

1797.

THIS
DISSERTATION
IS
RESPECTFULLY INSCRIBED
TO
PHILIP S. PHYSICK, M. D.
ONE OF THE SURGEONS AND PHYSICIANS
TO THE
PENNSYLVANIA HOSPITAL,
AS A TRIBUTE OF GRATITUDE AND ESTEEM;
BY HIS SINCERE FRIEND,
AND AFFECTIONATE PUPIL,
SAMUEL JONES.

P R E F A C E.

THE Author of the following Treatise is of opinion that in duty to himself he should premise, that unavoidable business engaged his attention, during by far the greatest part of the time allotted to Graduates in Medicine for preparing their Theses. He therefore particularly claims the indulgence of medical Gentlemen, and of others into whose hands this may come, for any inaccuracies that may appear in this his first public performance.

A

DISSERTATION

ON

H Y D R O C E L E.

IN the following Pages I shall endeavour to give a concise view of the Disorder generally known by the term *Hydrocele*, according to the present acceptance of the word. The narrow limits to which a piece of this sort is generally confined, will unavoidably prevent a full discussion of all the particulars relating to that Disorder ; I shall therefore content myself with a relation of those which appear to be the most important.

The Disorder we are now treating of, was by the Ancients included under the general term Hernia, or Rupture. If the tumor in the Scrotum, or along

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the Spermatic Cord, was formed by a protrusion of any of the abdominal viscera, it was called a true Hernia ; if it contained a fluid, it was called a false Hernia, on the supposition that the fluid came from the Abdomen, between which and the tumor they believed there was a direct communication. Moderns however, being better acquainted with the structure of these parts, are convinced that such a communication scarcely ever exists, unless for a short time after birth.

The term *Hydrocele*, being derived from *υδωρ aqua* and *τύμπα tumor*, might, from the Etymology of it, be applied with propriety to a watery tumor situated on any part of the body ; but Surgeons have agreed to denominate by it, such collections of water only, as are found in the Scrotum, or along the course of the Spermatic Cord.

For the better understanding the relative situation of the different species of this Disorder, it appears necessary, before we proceed any further, to give a short description of the parts concerned, and the changes they undergo a short time before birth.

The Testes in the Foetus, till about the eighth month, are not found in the Scrotum as in the Adult ; but lay in the Abdomen a little below the kidneys, on the Psoæ muscles. They are covered with the Peritoneum as the rest of the abdominal viscera, except at their back part, where it is reflected from them ; at which place their blood-vessels, nerves, &c. enter. The two spermatic arteries arise from the Aorta, between the Emulgent and inferior Mesenteric. The veins empty, the right into the Vena Cava, the left into the Emulgent. When each artery has nearly reached the Testis it divides into several branches, one supplies the Epididimis, the others enter the Testis, and are there curiously convoluted round each other, forming a considerable part of the body of it. In these convolutions the Semen is secreted, and carried off by the Vasa Efferentia, ten or fifteen in number, which meeting together form the superior and larger end of the Epididimis ; the small vessel they form when united, by innumerable windings, makes up the smaller end. This vessel, after it leaves the Epididimis, is called Vas Deferens. The blood which is not used in forming Semen or

nourishing the Testes is returned by the Spermatic veins.

To the lower end of each Testis and Epididymis is attached the largest end of a Ligament which is something of the shape of a Pyramid, called **Gubernaculum Testis**. This Ligament runs down behind the Peritoneum to the Abdominal Ring, through which it passes, and still diminishing in diameter, it descends into the Scrotum, and is united to the lower part of it. This Ligament serves as a director to the Testis in its descent; and the largest end may be useful in dilating the Abdominal Ring.

The Testes, in most cases, descend into the Scrotum about three or four weeks before birth; in some instances sooner, in others later: in a few, they remain in the Abdomen, or at least within the Abdominal Ring, through the whole course of life; but these last may be considered as *Lusus Naturæ*.

The peritoneal covering, which the Testes have whilst in the Abdomen, retains its firm attachment to them during their descent, and afterwards; and

forms their immediately investing membrane called Tunica Albuginea. As the Testes descend, they carry along with them that part of the Peritoneum, which, in the Abdomen, was reflected from them: this must necessarily form an additional covering to them. Immediately after their descent, that process of the Peritoneum which they carried down with them forms a canal leading to the Abdomen; therefore about the time of Birth, some of the abdominal viscera may descend into the Scrotum, without any part being ruptured; in which case they will be in contact with the Tunica Albuginea: this is called Congenial Hernia. In this state of the parts, water may descend into the Scrotum; or if collected there, may be pressed up into the Abdomen. But this is not long the case; for, soon after the Testis has reached its destined situation, the upper part of the canal begins to contract, and in a short time it is entirely obliterated as far down as the Testis. The lower part which loosely envelops the Testis is called Tunica Vaginalis; which does not adhere except at its posterior part, where it is reflected from the Tunica Albuginea. The Testes, and their investing membrane just described, are contained in what is

called the Scrotum, which consists of the common integuments, and a loose cellular membrane called Dartos. This membrane was formerly supposed to be muscular, but that opinion is now generally considered as erroneous. For the muscularity, evident in this part, is to be ascribed to the Cremaster; which appears to be a process of the Obliquus Internus Muscle. The cells of this membrane, which contain no adipose matter, freely communicate with each other, and with those of the same substance which is found extending so generally over the whole body.

The course of the Spermatic Cord well deserves a few remarks, as it has been differently described by different Authors. After it emerges from the Abdomen, Mr. Pott says it passes *under* the Transversalis and Obliquus Internus Muscles, and not *through* them, as some will have it. From some dissections which I lately had an opportunity of making, I am fully convinced Mr. Pott is right. After the Cord passes under these Muscles, it penetrates through a fissure in the tendon of the Obliquus Externus, and then extends down to the Testis. The fissure just spoken of is called the Abdominal Ring.

Along the whole course of the Spermatic Process we find a cellular membrane investing it, and connecting its vessels. This membrane was formerly called Tunica Vaginalis Vasorum Spermaticorum, but very improperly, as it does not form a sheath for the Cord. It is now mostly denominated Tunica Communis: the cells of which have a free communication with each other, although not with the general cellular membrane.

I have been more prolix in the description of the parts concerned, than I at first intended; but if I have in any measure conveyed a just idea of their structure and relative situation, I may with propriety be the more concise in what remains.

We frequently find a collection of water in the cells of the Dartos, distending the whole Scrotum. Mr. Bell and others have treated of this complaint as one kind of Hydrocele, but I think improperly; as it is only symptomatic of general anasarca, and not caused by local disorder, or curable by local remedies. However, as the Surgeon is often called upon to afford temporary relief, it may not be amiss to

describe its appearance, and the palliative cure. The whole Scrotum is equally distended, the Raphe or Seam is found in the middle; upon being pressed with the fingers, pits are formed in it, which remain for some time; the Testes lay in the middle of the tumor; the Spermatic Cord can be easily felt, and is of its natural size. A surgical operation, in this case, can but prove a palliative remedy. Either an incision, or punctures are to be made through the integuments into the loaded Dartos; and the water will soon be drawn off. The latter method, viz. by punctures, as it is as effectual, is much preferable to that by incision; the wounds being so much smaller, there is less danger of mortification. We should always recollect, when operating on membranous parts, that they possess the power of restoration in a much less degree than those that are muscular. This should induce us to injure them as little as possible so as to accomplish the end in view.

Not considering a collection of water in the Dartos a species of Hydrocele, we shall have three kinds:

1st. An effusion of water into the cells of the Tunica Communis;

2d. A collection of the same fluid in a cist formed either in the Tunica Communis, or in the Dartos; perhaps one of their cells enlarged; and

3d. A superabundant quantity of water in the Tunica Vaginalis. Each of these three kinds is mostly a local disease, and may be cured by local treatment. The cause of each, as of Dropfy in other parts, must depend upon increased effusion or diminished absorption. I am inclined to think the former, viz. increased effusion, is by much the most frequent cause. I can indeed conceive, that a tumor in the course of the absorbent vessels going from the part, may obstruct the passage of a fluid through them; but I suspect it is very seldom the cause of the accumulation. Neither do I think that a primary deficiency of action in the Absorbents is to be considered as the cause. But that it is owing to an inflammatory action in the Arteries of the part, causing an increased secretion, and consequently effusion. We know that inflammatory action will have this effect, as we frequently find Hydrocele produced by local injury. And Doctor Rush, the ingenious Professor of the Institutes of Medicine, to whom I thus publicly acknowledge myself indebted

for many invaluable principles in Medicine, has taught us, that inflammatory action in the Arteries will cause Dropfy: hence the propriety and great success of bleeding, purging, &c. in curing it.

It is observable I differ from Authors who have written on this disorder, in mentioning the part in which the cist may be formed. They tell us it is always formed in the Tunica Communis; and that therefore the Testis is found below the tumor. I am however fully convinced that this opinion is erroneous. I lately saw a case, which might be called a posterior Hydrocele, where the collection of water was in a cist, formed in the Dartos. The Testis was easily distinguished to be on the anterior superior part. This could not be the case if the cist was formed in the Tunica Communis; or if the water was collected in the Tunica Vaginalis. The puncture, through which the water was evacuated when the operation for a radical cure was performed, was made in the posterior inferior part, for the sake of avoiding the Testis; and the whole succeeded happily. And indeed, reasoning from analogy, I cannot see why the cist should not be formed in the cellular

structure of the Dartos, as well as in that of the Tunica Communis.

The Hydrocele of the cells of the Tunica Communis is a disease which seldom appears. When it does occur, it may be distinguished from the other species by the following Characteristics: the Scrotum feels heavier on that side than on the other, and hangs somewhat lower; the Testis, of its natural size, can readily be felt below the tumor; the whole spermatic process is enlarged, but more below than above; the pain is described as being in the loins, and not in the tumor. Sometimes the swelling extends up within the Abdominal Ring; in that case the ring is found to be somewhat dilated. When the tumor is small, the inconvenience is too trifling to induce the Patient to submit to a surgical operation for its removal. But when it is large, the disagreeable appearance and pain which it produces will oblige him to seek for relief. This can only be had from Surgery. Punctures will produce temporary ease, by evacuating the water; but it will soon collect again. And a radical cure can only be expected from a free incision, made the whole length of the tumor. The

wound is afterwards to be lightly dressed ; and if much inflammation should succeed, bleeding, purging and a low diet will be proper, together with a poultice applied to the part.

Incised Hydrocele may be divided into three kinds, according to the different part where the cist is found ; in one it is in the Tunica Communis, in another, in the Dartos, and in the other the Tunica Vaginalis forms it. The two former, however, we shall consider as one species.

The preternatural cist in Hydrocele, as was before observed, may exist either in the Tunica Communis or in the Dartos. This species may easily be distinguished from a collection of water in the cells of these membranes, by being more circumscribed, and by not retaining an impression of the fingers. But it is more likely to be confounded with Hernia, or Hydrocele of the Tunica Vaginalis. From the former we can distinguish it by the disorder having come on gradually ; by feeling the upper part of the process free, and of its natural size ; by the tumor not being increased by coughing, sneezing, &c. and by its

being incapable of reduction. From the latter, by the Testis being much easier discovered, and the whole tumor having a more uniform hardness.

This disorder afflicts children much more frequently than Adults ; in the former, bleeding, purging and a low diet will often speedily effect a cure ; in the latter they will but seldom succeed.

I had a case of incised Hydrocele under my own care last summer, in a boy of seven or eight years of age. It yielded in five days to one bleeding, three or four purges, rest and a low diet.

Puncture with a lancet will frequently, in children, cause so much inflammation, that adhesion will take place in the cist, and a radical cure be effected ; this, however, is hardly ever the case in Adults. I shall defer further treating on methods of effecting a radical cure in this kind of Hydrocele, till I have described the remaining species, as I think they are both to be treated in the same way.

The cavity of the Tunica Vaginalis is naturally kept moist by a small quantity of a pellucid fluid ; if this should be increased by any means it will constitute the third species of Hydrocele. This disorder can be distinguished from Hernia, by the spermatic vessels being easily felt in the groin ; by its coming on more slowly, and not being capable of reduction. It will not retain the impression of the fingers like the anasarcous swelling of the Scrotum ; and thereby can be distinguished from it. In an Hydrocele of the Tunica Vaginalis, the Testis is always found in the posterior part of the tumor ; and some transparency is frequently observable, as well as fluctuation *.

The cure of the Hydrocele of the Tunica Vaginalis, and of the incised Hydrocele last mentioned, may be divided into palliative and radical. The former may be effected with a common bleeding lancet, or with a trocar. The perforation should be made in a depending part of the tumor, and at so great a

* I shall omit treating of Hæmatocèle, Hernia Humoralis, Varicocele, Scirrhous, Cirsocèle, Sarcocele, and such other disorders to which these parts are liable ; although Authors generally include them in a treatise on Hydrocele. But they could not be comprised within the narrow limits of a Thesis.

distance from the Testis as to avoid the danger of wounding it. The operation should be performed as early in the disease as the quantity of water will admit. Upon this plan there will be a greater chance of effecting a permanent cure; which the inflammation caused by the puncture will sometimes accomplish. But in most cases the relief will be but temporary; and we shall be obliged to have recourse to means for a radical cure.

There have been various means described, as effectual in radically curing this disorder: the use of the Tent, Canula, Ligature and Cautery I shall omit describing, as they are now very generally discarded; and shall only treat of the Incision, Caustic, Seton and Injection, which are some of the most modern and useful. Each of these have had their strenuous advocates. Mr. Else preferred the *Caustic*, Mr. Bell strongly recommends the *Incision*, and Mr. Pott expresses himself thus, “I am, from very frequently repeated experience, convinced, that the cure by the *Seton* is by much the least hazardous, painful, or fatiguing, as well as the most expeditious and certain of any yet proposed.” Mr. Earle, in a late edition

of Pott's Works, has advised the use of *Injection*: and from the universal success which I have seen attend it in Dr. Physick's practice; the little inconvenience, pain and confinement which it causes; and the certainty of its proving effectual; I am induced to believe it is far preferable to any of the other means.

The end, that each method of performing a radical cure is designed to produce, is an adhesion of the sides of the cavity, so as to entirely obliterate it. And as it is a principle in the animal economy that two inflamed surfaces kept in contact will adhere; our object should be to produce such inflammation in the internal surface of the cist, that adhesion will be effected. It is a favourable circumstance for the patient, that a less degree of inflammation will produce adhesion, than takes place in suppuration.

Either of the methods to be treated of will produce the requisite inflammation, but as I greatly prefer that by *Injection*, I shall describe it first; and compare the other methods with it, when treating of each.

A puncture is to be made into the tumor, in a part that is depending, and sufficiently distant from the Testis. I am convinced that it is better to make the puncture with a broad lancet than with a trocar; for it will cause less pain, will heal much sooner, and there will be less danger of wounding the Testis*. Immediately after withdrawing the broad lancet, as the water flows out a canula is to be introduced, and one end of the incision grasped between the thumb and fore finger, so as to prevent the water from passing, except through the canula. After the water is all drawn off, wine of 98° of Fahrenheit is to be injected, and left in till the patient complains of pain; which will require perhaps from three to six minutes. Madeira wine I think equal to any for an

* These three particulars will appear evident upon a little reflection. A thin lancet will surely cause less pain than a thick stilette; the incised wound it makes will certainly heal much sooner than a punctured wound made by a trocar; and a sharp lancet will be far less liable than the stilette, to indent the integuments so much before it penetrates, and to go in so much with a jerk, as to be in danger of wounding the Testis on entering. It has been objected to this practice, that a difficulty may attend the introduction of the canula after the lancet is withdrawn. But I think if the puncture is made of a proper size it can easily be accomplished. Thus much at least I can say respecting it, that in the dexterous steady hand of Dr. Physick, it is a thing very practicable.

injection, as it is considerably uniform in strength. It may be used undiluted, unless it is probable the patient is of a peculiarly irritable habit; in which case some water may be added. After the injection has caused the pain requisite, it must be evacuated, and a piece of sticking plaster applied to the orifice. The Scrotum should be suspended by a T bandage, and the patient kept quiet for a few days. Inflammation will soon take place, and in a little while come to its height, which is generally very moderate: if, however, the swelling and pain should be considerable, (which is but very seldom the case,) a warm bread and milk poultice should be applied, laxatives administered, and the antiphlogistic regimen strictly observed. In most cases the swelling in a short time begins to subside, and in a few days the inflamed surfaces of the sack adhering, the inflammation with all its concomitant symptoms going off, a radical cure is obtained *.

* Mr. Hunter was induced to prefer filling the cist with poultice, knowing that as the cist contracted, the poultice would be gradually expressed; and finally the cavity entirely obliterated. This plan has a great deal of plausibility in it; but it is surely much more tedious, painful and loathsome than that by *Injection*.

The operation by *Incision* is performed by making a puncture with a lancet in the lower end of the tumor, and introducing the fore finger of the left hand, on which the integuments must be cut, so as to lay open the sack nearly its whole length. Or a Director may be introduced at the orifice made by the lancet, and passed up to the upper end of the cavity, on which the incision may be made. This operation, it is true, will prove effectual, and is easily performed; but it is tenfold more painful than that by *Injection*, and will require as many weeks to heal, as that will days.

The operation by *Caustic* is worse than that by *Incision*, as it is more painful, dangerous and tedious. A layer of paste *Caustic* of about half an inch in breadth, and nearly the length of the cist, is confined on the integuments by sticking *plaster*, till it produces its effects. It will however but seldom penetrate into the cavity of the sack, and must afterwards be assisted by the *Knife*. It then is nearly in the same state as that by *Incision*, only worse, as the edges of the wound are more inflamed and uneven.

I shall, in the last place, describe the operation by means of a *Seton*. Perhaps the best plan of operating is to have a trocar somewhat larger than common ; which is to be plunged into the inferior part of the cist, and then the stilette withdrawn. Before the water runs off, a canula, which is at least an inch longer than the cist, and of a proper size, is to be introduced through the canula of the Trocar, and the upper end of it passed up to the superior part of the cist, and pressed against the place in the integuments where the Seton is to be brought out. Then a straight round needle with a sharp point, armed with a Seton, is to be inserted through the canula, and passed out through the integuments above. A sufficient quantity of the Seton being brought out at the upper orifice, and the canulæ withdrawn, the operation will be completed.

Although Mr. Pott has much improved and highly recommended this his favorite plan of operating, yet I think when we reflect on the necessary consequences of a rough extraneous substance being so long retained in contact with so sensible a membrane ; the adhe-

sions which frequently take place between it and the sides of the cist; the consequent distressing pain caused by moving it; and the partial affection it produces, which must necessarily be very violent to become sufficiently general; we shall be induced to consider it by no means as eligible as that by *Injection*.

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